In The Claims:

Please amend the claims as follows:

1. (currently amended) A manufacturing method of a shallow trench isolation (STI) structure, the method comprising:

providing a substrate, wherein a patterned pad oxide layer and a mask layer are formed on the substrate, and at least a trench is formed in the substrate, wherein the trench is formed by exposing a portion of the pad oxide layer and the mask layer;

forming a liner layer on a surface of the trench;

performing a high density plasma chemical vapor deposition (HDP-CVD) process to form an isolation layer comprising a first layer and a second layer on the substrate and over the trench, wherein the trench is completely filled with the isolation layer, wherein the high density plasma chemical vapor deposition (HDP-CVD) process comprises a first stage process for forming the first layer and a second stage process for forming the second layer, and a bias power of the second stage process is higher than a bias power of the first stage process, and a deposition to etching ratio of the second stage process (d2/e2) is lower than a deposition to etching ratio of the first stage process (d1/e1), wherein the second layer is denser than the first layer;

removing the isolation layer over the trench;

removing the mask layer; and

removing the pad oxide layer.

2. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the bias power of the first stage process is in a range of about 900W to about 2500W.

3. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the bias power of the second stage process is in a range of about 2500W to about 3300W.

4. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the deposition to etching ratio of the first stage process is in a range of about 10 to about 20.

5. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the deposition to etching ratio of the second stage process is in a range of about 5 to about 10.

6. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the bias power of the second stage process is in a range of about 2500W to about 3300W, and the deposition to etching ratio of the second stage process is in a range of about 5 to about 10.

7. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein a material of the isolation layer comprises silicon oxide.

8. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the mask layer comprises a bottom silicon nitride layer on the bottom and a top silicon oxide layer.

9. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 8, wherein the step of removing the isolation layer over the trench further comprises a step of removing the silicon oxide layer.

10. (currently amended) A manufacturing method of shallow trench isolation (STI) structure, the method comprising:

providing a substrate, wherein a patterned pad oxide layer and a mask layer are formed on the substrate, and at least a trench is formed in the substrate, wherein the trench is formed by exposing a portion of the pad oxide layer and the mask layer;

performing an etch-back process to the mask layer to pull back the mask layer;

forming a liner layer on a surface of the trench;

performing a high density plasma chemical vapor deposition (HDP-CVD) process to form an isolation layer comprising a first layer and a second layer on the substrate and over the trench, wherein the trench is completely filled with the isolation layer, wherein the high density plasma chemical vapor deposition (HDP-CVD) process comprise a first stage process for forming the first layer and a second stage process for forming the second layer, a bias power of the second stage process is higher than a bias power of the first stage process, and a deposition to etching ratio of the second stage process (d2/e2) is lower than a deposition to etching ratio of the first stage process (d1/e1), wherein the second layer is denser than the first layer;

removing the isolation layer over the trench;

removing the mask layer; and

removing the pad oxide layer.

11. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the bias power of the first stage process is in a range of about 900W to about 2500W.

12. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the bias power of the second stage process is in a range of about 2500W to about 3300W.

13. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the deposition to etching ratio of the first stage process is in a range of about 10 to about 20.

14. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the deposition to etching ratio of the second stage process is in a range of about 5 to about 10.

15. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the bias power of the second stage process is in a range of about 2500W to about 3300W, and the deposition to etching ratio of the second stage process is in a range of about 5 to about 10.

16. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein a material of the isolation layer comprises silicon oxide.

17. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the mask layer comprises a bottom silicon nitride layer and a top silicon oxide layer.

18. (original) The manufacturing method of shallow trench isolation (STI) structure of claim 17, wherein the step of removing the isolation layer over the trench further comprises a step of removing the silicon oxide layer.

19. (new) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the deposition rate d2 in the second stage process is equal to the deposition rate d1 in the first stage process, and the etching rate e2 in the second stage process is larger than the etching rate e1 in the first stage process.

20. (new) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the deposition rate d2 in the second stage process is equal to the deposition rate d1 in the first stage process, and the etching rate e2 in the second stage process is larger than the etching rate e1 in the first stage process.

21. (new) The manufacturing method of shallow trench isolation (STI) structure of claim 1, wherein the first layer formed by the first stage process is non-conformal.

22. (new) The manufacturing method of shallow trench isolation (STI) structure of claim 10, wherein the first layer formed by the first stage process is non-conformal.